US005483731A

United States Patent [19]

Prendel et al.

[11] **Patent Number: 5,483,731**

[45] **Date of Patent: Jan. 16, 1996**

[54] **UNIVERSAL HYDRAULIC TOOL**

[75] Inventors: **Troy A. Prendel**, Jackson; **Timothy D. Mulligan**, Blissfield, both of Mich.

[73] Assignee: **Aeroquip Corporation**, Maumee, Ohio

[21] Appl. No.: **187,109**

[22] Filed: **Jan. 26, 1994**

[51] **Int. Cl.**[6] **B23P 19/04**

[52] **U.S. Cl.** **29/237**; 29/252; 29/282

[58] **Field of Search** 29/237, 252, 283.5, 29/432, 525, 282; 285/382, 382.1–382.7, 39

[56] **References Cited**

U.S. PATENT DOCUMENTS

1,018,035	2/1912	DeLeeuw .	
2,623,080	12/1952	Young .	
2,695,539	11/1954	Grueninger .	
3,700,227	10/1972	Sessody .	
3,827,727	8/1974	Moebius .	
4,026,006	5/1977	Moebius .	
4,189,817	2/1980	Moebius .	
4,257,135	3/1981	Moebius .	
4,482,174	11/1984	Puri .	
5,297,325	3/1994	Thelen .	
5,305,510	4/1994	Croft et al.	29/237

FOREIGN PATENT DOCUMENTS

3039818 3/1982 Germany .

OTHER PUBLICATIONS

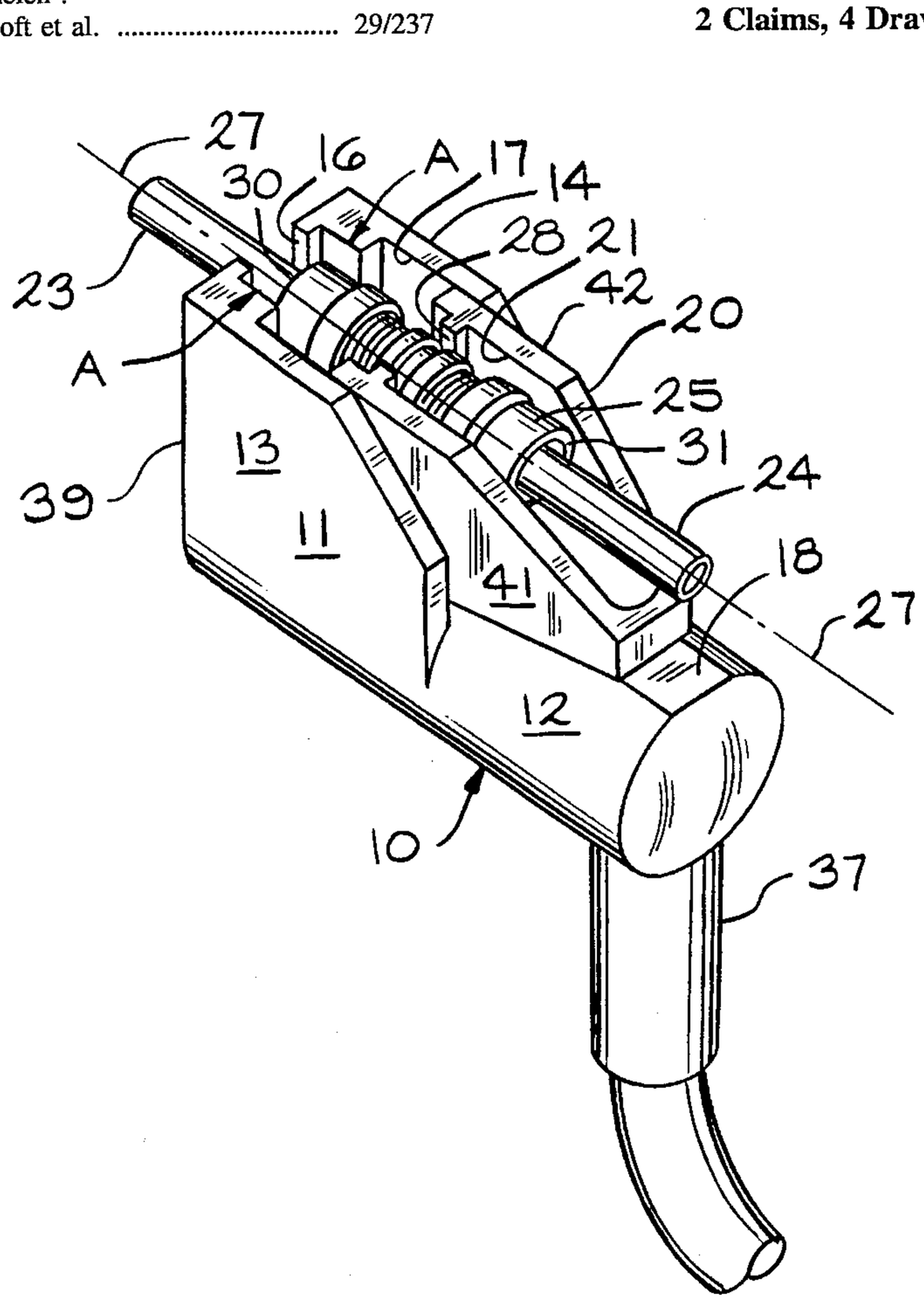
Deutsch Permalite Series Brochure, Performance and reliability of metal–to–metal, mechanical seals., Deutsch Metal Components, dated Aug. 1992.

Primary Examiner—Robert C. Watson
Attorney, Agent, or Firm—Emch, Schaffer, Schaub & Porcello

[57] **ABSTRACT**

A universal hydraulic tool for compressing a connector fitting to tube portions to be joined is disclosed. The tool includes a base member and a tool member which define aligned receiving chambers. The base member defines a first jaw set and a slide member defines a second jaw set. The reception chambers have a width adjacent the jaw sets slightly larger than the connector fitting end. The base member mounts a cylinder having a piston operatively connected to the slide member. Relative movement between the base member and the slide member compress the connector fitting in either the forward direction or the reverse direction to form the desired tube joint without using a different hydraulic tool.

2 Claims, 4 Drawing Sheets



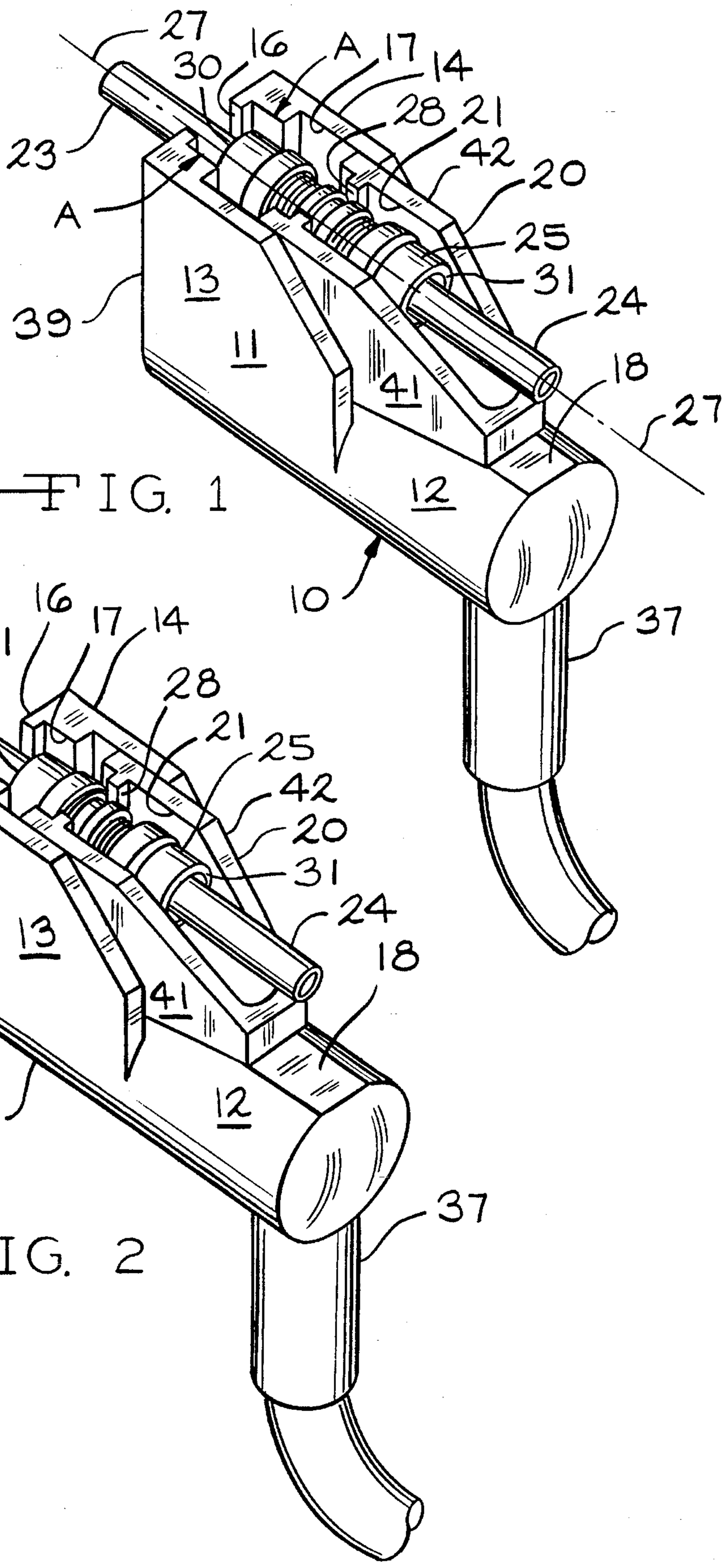

27
30
16
A
17
14
23
28
21
42
20
A
25
31
13
24
39
11
18
41
27
12
10
37

FIG. 1

23
16
17
14
31
28
21
25
42
20
39
31
24
13
18
41
10
11
12
37

FIG. 2

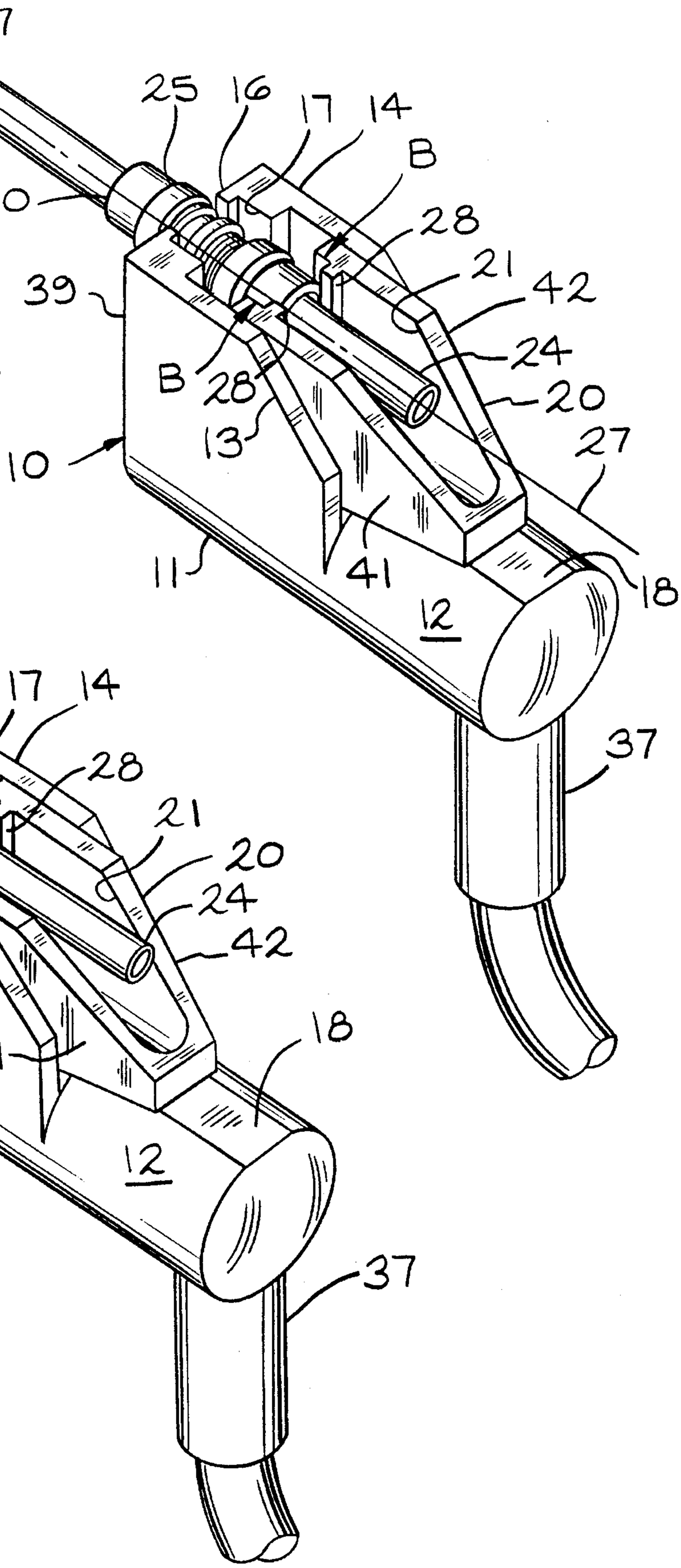

27
25
16
17
14
23
B
30
28
21
42
39
24
B
28
20
13
27
10
41
11
18
12
37

FIG. 3

23
25
30
16
17
14
28
21
20
24
39
42
13
10
18
41
11
12
37

FIG. 4

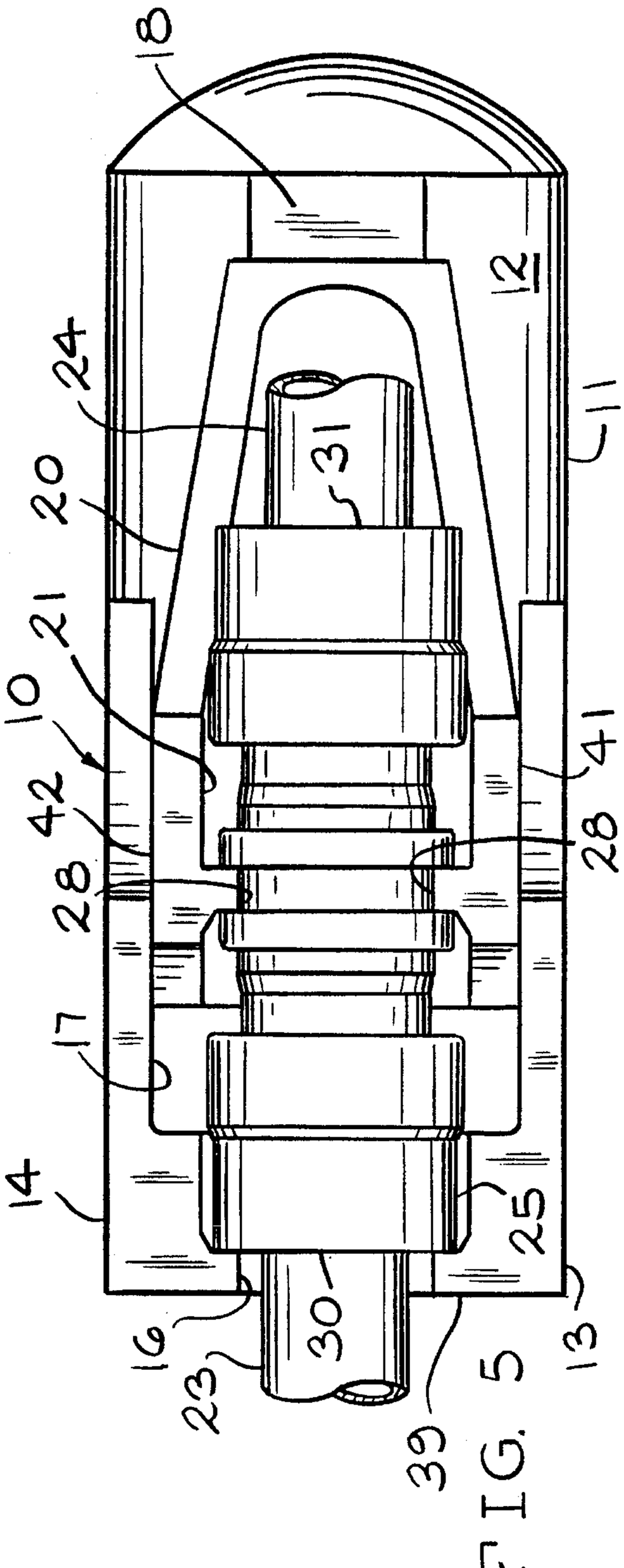

80
12
24
31
20
21
10
42
28
17
14
16
23
30
39
41
28
25
13
11

FIG. 5

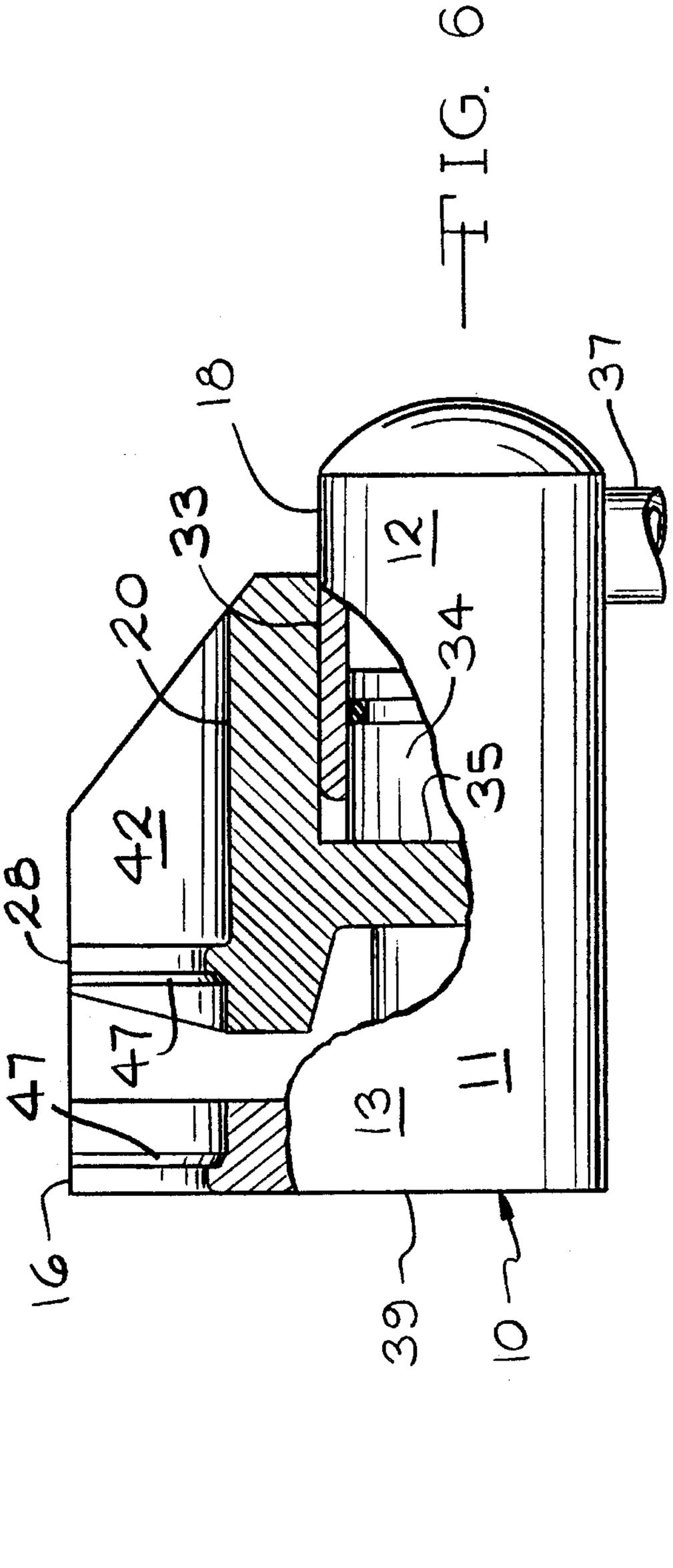

18
37
33
12
20
34
35
42
28
47
47
13
11
16
39
10

FIG. 6

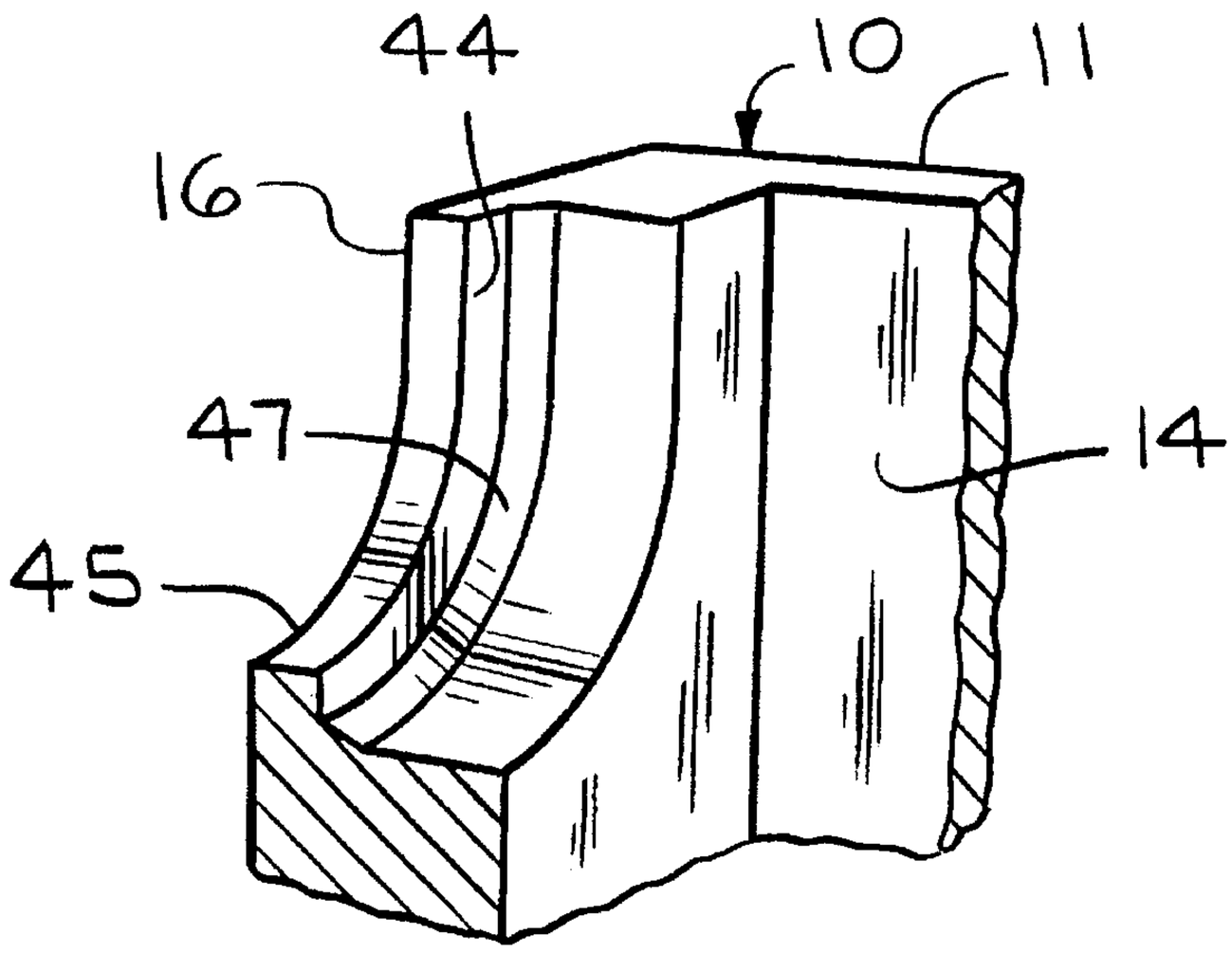


FIG. 7

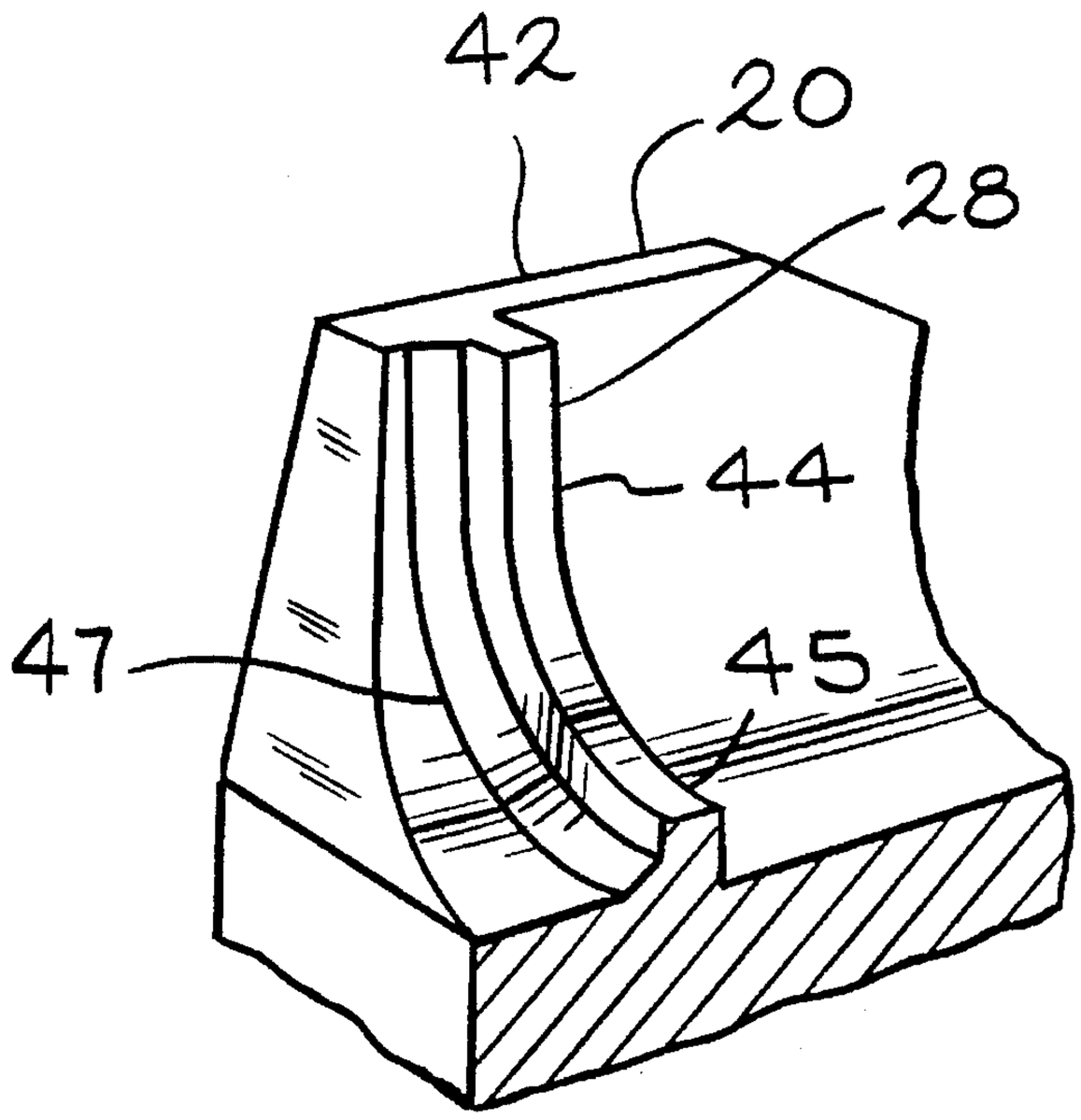


FIG. 8

UNIVERSAL HYDRAULIC TOOL

BACKGROUND OF THE INVENTION

The present invention is directed to a hydraulic tool for compressing or swaging together connectors on tubes. More specifically, the present invention is directed to a universal hydraulic tool which may be used in either a forward or reverse direction.

The present universal hydraulic tool is particularly useful for joining tubular components to form a permanent tube joint of a type where a constrictor ring with a tapered bore is axially forced over a collar encircling the end of the tube to cause local annular compression of the collar and the encircled tube. Tube joints of this type are shown in a number of prior art patents, including U.S. Pat. Nos. 3,827,727; 4,026,006 and 4,482,174. Tube joints of this type require significant amounts of axial force to cause the constrictor ring to be moved axially over the collar member while radially compressing and deforming it and the tube encircled by the collar.

U.S. Pat. No. 4,189,817 discloses a hydraulic assembly tool for tube fittings which may be used for assembling the components of the tube joints described in the above patents. An improved hydraulic assembly tool is disclosed in U.S. patent application Ser. No. 08/029,828, filed Mar. 11, 1993 now U.S. Pat. No. 5,297,325. The disclosure in that application is incorporated herein by reference.

SUMMARY OF THE INVENTION

The present invention is directed to an improved universal hydraulic tool specifically designed to assemble tube joints of the type described above in both the forward and reversed directions. This is particularly meaningful in assembling tube joints in close quarters, such as adjacent bulk heads in airplanes. The universal hydraulic tool, according to the present invention, includes a base member and a slide member mounted for relative movement on the base member. The base member includes piston means operatively connected to the slide member. The base member and the slide member define aligned first and second tube reception chambers for receiving tube portions and a connector fitting. The base member defines a first jaw set and the sliding member defines a second jaw set. The jaw sets are in opposed relationship to one another and are mounted on the centerline of the aligned reception chambers. The jaw sets are positioned perpendicular to the centerline. The first and second reception chambers have a width adjacent the jaw sets slightly larger than the width of the connector fitting end. The base member has a generally planar front surface adjacent the first jaw set and perpendicular to the centerline.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a universal hydraulic tool, according to the present invention, prior to reverse actuation of the tool;

FIG. **2** is perspective view, similar to FIG. **1**, and showing the position of the components after the reverse movement has been completed;

FIG. **3** is a perspective view, similar to FIG. **1**, after repositioning of the universal hydraulic tool and prior to forward actuation of the tool;

FIG. **4** is a perspective view, similar to FIG. **1**, showing the components after forward actuation of the tool;

FIG. **5** is a top plan view of the universal hydraulic tool, as shown in FIG. **1** and shown on an enlarged scale;

FIG. **6** is a fragmentary sectional view of the universal hydraulic tool shown in FIG. **5** and shown on a reduced scale;

FIG. **7** is a fragmentary view of the first jaw set and showing in particular the centering ramp; and

FIG. **8** is a view similar to FIG. **7** showing the second jaw set and its centering ramp.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A universal hydraulic tool, according to the present invention, is generally indicated by the reference number **10** in FIG. **1**. The tool **10** includes a base member **11** having a generally cylindrical body **12** and integral sidewalls **13** and **14** extending upwardly from the body **12**. The base member **11** defines a first jaw set **16** and a longitudinally extending reception chamber **17**. The base member **11** defines an upper flat slide surface **18**. A slide member **20** is mounted for movement along the surface **18**. The sliding member **20** defines a reception chamber **21** which is aligned with the reception chamber **17** of the base member **11**. Tube portions **23** and **24** are received in a connector fitting **25** and are positioned within the aligned reception chambers **17** and **21** along a longitudinal centerline **27**.

The slide member **20** defines a second jaw set **28** in opposed relationship to the first jaw set **16**.

Referring to FIGS. **1** and **3**, the base member **11** defines a width A adjacent the jaw set **16** and the slide member **20** defines a width B adjacent the second jaw set **28**. The connector fitting **25** in the present embodiment includes ends **30** and **31** having a predetermined width or diameter. The first and second reception chambers **17** and **21** have widths adjacent the first and second jaw sets **16** and **28** slightly larger than the width of the connector fitting ends **30** and **31**. The widths "A" and "B" are slightly larger than the ends **30** and **31**. The widths "A" and "B" are equal to one another in the present embodiment.

In the present embodiment the first jaw set **16** and the second jaw set **28** have predetermined thickness dimensions, measured along the longitudinal centerline **27**, generally equal to one another.

Referring to FIG. **6**, the body **12** of the base member **11** defines a cylinder **33**. A piston **34** is mounted in the cylinder **33** and is connected by an arm **35** to the slide member **20**. High pressure hydraulic fluid is introduced through a fluid conduit **37** into the cylinder **33**. The high pressure fluid drives the slide member **20** and generates forces in excess of 5000 psi to compress or swage the connector fitting **25** to the tube portions **23** and **24**. A spring (not shown) is utilized to return the piston **34** to its home position. Referring to FIGS. **1** and **6**, the base member **11** has a generally planar front surface **39** closely adjacent the first jaw set **16**. The front surface **39** is perpendicular to the longitudinal centerline **27**. The design of the front surface **39** and its closeness to the first jaw set **16** allows the universal hydraulic tool **10** to be placed close to a partition or bulk head in the field, wherein a repair to tubing may be made in close quarters.

The slide member **20** includes sidewalls **41** and **42** which are movable within the sidewalls **13** and **14** of the base member **11** during relative movement of the base member **11** and the slide member **20**. Referring to FIGS. **1** and **7**, the first jaw set **16** defined by the base member **11** is generally "U"

shaped. Similarly, referring to FIG. **8**, the second jaw set **28** defined by the slide member **20** is also generally "U" shaped. Both the first and second jaw sets **16**, **20** including opposed vertical jaw portions **44** and a curved lower jaw portion **45** which is integral to and extends between the opposed vertical jaw portions **44**. If desired, as shown in FIGS. **6**, **7** and **8**, a centering ramp **47** is positioned adjacent the lower jaw portions **45** and upwardly along at least a part of the opposed vertical jaw portions **44**. The centering ramps **47** urge a misaligned connector fitting, for example, the connector fitting **25**, to a correct centered position along the longitudinal centerline **27** during relative movement of the base member **11** and the slide member **20**.

Referring to FIGS. **1–4**, a typical operation of the universal hydraulic tool **10** is illustrated. A connector fitting **25**, in the present embodiment a union-type connector fitting, has received a pair of tube portions **23** and **24** which are to be joined in a tight joint. These members are then received by the aligned reception chambers **17** and **21** defined by the base member **11** and the slide member **20**, respectively. The universal hydraulic tool **10** is then activated. The base member **11** and the slide member **20** move in a reverse direction to the position shown in FIG. **2**. The relative movement of the first jaw set **16** and the second jaw set **28** compress and swage the left hand portion of the connector fitting **25** (as shown in FIG. **1**).

At this time, without substituting tools, the universal hydraulic tool **10** is moved to the position shown in FIG. **3**. The universal hydraulic tool **10** is then activated and relative movement of the first jaw set **16** and the second jaw set **28** continues in the forward direction. This compresses or swages the right hand side of the connector fitting **25** (as viewed in FIG. **3**) to achieve the final tube joint.

Many revisions may be made to the above described embodiment without departing from the scope of the invention or from the following claims.

We claim:

1. A universal hydraulic tool comprising a base member and a slide member mounted for relative movement on said base member, said base member including piston means operatively connected to said slide member, said base member and said sliding member defining aligned first and second reception chambers for receiving tube portions and a connector fitting, said connector fitting having an end, said aligned reception chambers defining a longitudinal centerline, said base member defining a first jaw set, said sliding member defining a second jaw set, said jaw sets being in opposed relationship to one another and positioned perpendicular to said centerline, said jaw sets having predetermined thickness dimensions along said centerline substantially equal to one another, said first and second reception chambers having a width adjacent said jaw sets slightly larger than the width of said connector fitting end, said base member having a generally planar front surface adjacent said first jaw set and perpendicular to said centerline.

2. A universal hydraulic tool according to claim **1**, wherein each of said jaw sets are generally "U" shaped, said jaw sets including opposed vertical jaw portions and a curved lower jaw portion between said opposed vertical jaw portions, .and a centering ramp positioned adjacent said lower jaw portions and at least a part of said opposed vertical jaw portions, wherein a misaligned connector fitting is engaged by said ramp and is urged to a centered position during relative movement of said base member and said slide member.

* * * * *